

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
1 September 2005 (01.09.2005)

PCT

(10) International Publication Number
WO 2005/080477 A3

(51) International Patent Classification⁷: **C08J 3/075**,
A61L 27/16, C08F 283/01, A61L 15/60, 27/52

(21) International Application Number:
PCT/US2005/004773

(22) International Filing Date: 4 February 2005 (04.02.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PCT/US04/03135 4 February 2004 (04.02.2004) US
10/771,852 4 February 2004 (04.02.2004) US

(63) Related by continuation (CON) or continuation-in-part
(CIP) to earlier applications:

US PCT/US04/03135 (CIP)
Filed on 4 February 2004 (04.02.2004)
US 10/771,852 (CIP)
Filed on 4 February 2004 (04.02.2004)

(71) Applicant (for all designated States except US): **CAM-
BRIDGE POLYMER GROUP, INC.** [US/US]; 52-R
Roland Street, Boston, MA 02129-1234 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **RUBERTI, Jeffrey,
W.** [US/US]; 47 School Street, Lexington, MA 02421 (US).
BRAITHWAITE, Gavin J.C. [GB/US]; 860 Massachu-
setts Avenue, Unit 850-10, Cambridge, MA 02139-3026
(US).

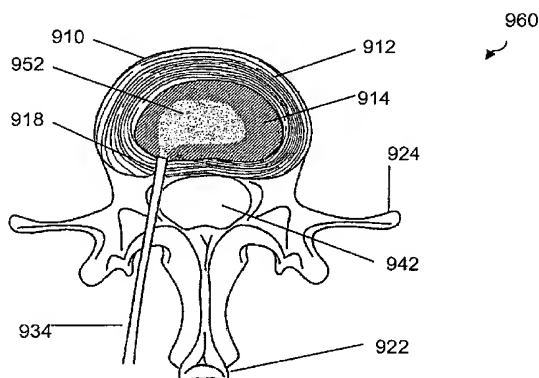
(74) Agents: **ISACSON, John, P.** et al.; Heller Ehrman LLP,
1717 Rhode Island Avenue, N.W., Washington, DC 20036-
3001 (US).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ,
TM, TN, TR, TT, TZ, UA, UG, US (patent), UZ, VC, VN,
YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,

[Continued on next page]

(54) Title: SYSTEMS AND METHODS FOR CONTROLLING AND FORMING POLYMER GELS



(57) Abstract: In preferred embodiments, the present invention provides methods of controllably making a vinyl polymer hydrogel having desired physical properties without chemical cross links or radiation. The gelation process is modulated by controlling, for example, the temperature of a resultant vinyl polymer mixture having a gellant or using active ingredients provided in an inactive gellant complex. In accordance with a preferred embodiment, the method of manufacturing a vinyl polymer hydrogel includes the steps of providing a vinyl polymer solution comprising a vinyl polymer dissolved in a first solvent; heating the vinyl polymer solution to a temperature elevated above the melting point of the physical associations of the vinyl polymer, mixing the vinyl polymer solution with a gellant, wherein the resulting mixture has a higher Flory interaction parameter than the vinyl polymer solution; inducing gelation of the mixture of vinyl polymer solution and gellant; and controlling the gelation rate to form a viscoelastic solution, wherein workability is maintained for a predetermined period, thereby making a vinyl polymer hydrogel having the desired physical property. In further preferred embodiments, the present invention provides physically crosslinked hydrogels produced by controlled gelation of viscoelastic solution wherein workability is maintained for a predetermined period. In another aspect, the present invention provides kits for use in repairing intervertebral disks or articulated joints including a dispenser and single use containers housing components that form the vinyl polymer hydrogel.



WO 2005/080477 A3



ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO,
SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *with international search report*

(88) Date of publication of the international search report:

10 November 2005